Outsourced Information Systems Failures in SMEs: a Multiple Case Study

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Abstract: Since the 1980s, a number of frameworks have been proposed for understanding the concept of information system (IS) failure. Two approaches to IS failures seem particularly important: the concept of Expectation Failure and the concept of Termination Failure. We argue that there is an extra dimension to the problem that is not covered by those descriptive models, which we call the Outsourced IS Failure (OISF). To explain the OISF we draw on agency theory, which views the problems that occur in outsourced environments as the results of three factors: goal differences, risk behaviour differences and information asymmetry. Although the (positivistic) agency theory has already been used to describe phenomena of failure in IT relations there is still a lack of empirical evidence.

This paper brings the results of the attempts of falsification of the agency theory in situations of OISF. A positivistic case study research was conducted based on multiple cases in SMEs. The choice for qualitative research is based on the accessibility of well documented secondary data in litigation files of failed IS projects. Eight cases of IS project failures subject to litigation were selected.

We conclude that the agency theory has strong prediction and explanation power for OISF. However some adjustments are needed to the agency theory. The theory seems to work in two ways, opportunistic behaviour is also observed on the side of the principal. The findings indicate that lack of trust is a prominent determinant for failure.

Keywords: IS outsourcing, SMEs, IS failures, Principal Agent theory, Organisational and Personal Trust

1. Introduction

Despite the numerous success stories illustrating the advantages of bringing information technology into organisations, it is broadly accepted that the processes of designing, developing and implementing are cumbersome and not straightforward. Recent and older reports show that IS projects frequently fail. The broad and elaborate research on IS failures has been conducted for more than four decennia (Ackoff, 1967, Lucas, 1975; Lyytinen & Hirschheim, 1987; Sauer, 1993; Keil, 1995; Beynon-Davies, 1999; Schmidt et al, 2001; Ewushi-Mensah, 2003; Iacovou & Dexter, 2005; Avison et al, 2006).

IS failures can be divided in *expectation* (Lyytinen, 1987) and *termination* (Sauer, 1993) failures. Expectation failures can be categorised in *correspondence*, *process* and *interaction* failures. *Correspondence failures* occur when IS are evaluated towards previous defined design objectives. A lack of correspondence between design objectives and evaluation is seen as a failure. *Process failures* occur when there is unsatisfactory development performance, i.e., one fails to produce a workable system or to deliver within the budget constraints of time and costs. Process failures are sometimes called 'runaways' or escalating projects (Iacovou, 2004; Keil, 1995). *Interaction failures* are situated within the mismatch between requirements and user acceptance. An interaction failure appears when an IS is not used. In summary, an IS expectation failure is the inability of an IS to meet the expectations of the stakeholders.

Sauer brought up the more pragmatic concept of the termination failure (Sauer, 1993). According to Sauer an IS failure can only occur when the development process or operation of an IS causes dissatisfied stakeholders to abandon the project.

One of the most intriguing questions is: why do IS still fail if we known what causes a failure? The answer is that we still do not really understand the nature of IS failures. Various small, apparently insignificant factors interact with each other leading to a complex amalgam that is hard to identify. If additional problems occur or if the root causes of the original problems are not effectively addressed, the problems grow worse. Software engineering has only evolved during the last half of the twentieth century and its culture is still immature. In times of rapidly advancing technology and fierce competition good engineering practices are reluctantly adopted. Being able to provide complex software solutions of good quality has become critical in differentiating success from failure.

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Not all causes of failure have an objective nature or seem to be connected with technology but tend to lean on fashion, perception, expectancy, pressure, internal or external politics and cognitive processes. Smith and Keil believe that some failures involve psychological, social and organisational issues that cannot be addressed with techniques such as the critical path method or joint application development (Smith & Keil, 2003:70).

We argue that there is an extra dimension to IS failures that is not covered by those descriptive models, which we call the Outsourced IS Failure (OISF). An OISF is a failure that occurs during an IS project in an outsourced environment. We use the taxonomy of Lacity and Hirschheim (in Dibbern et al., 2004:10) of outsourcing options and focus on Project Management. Some academics have already pointed out that outsourcing increases risks leading to IS failures (Natovich, 2003; Aubert et al, 2003).

We conducted a case study research based on multiple cases in SMEs. The choice for qualitative research was based on the accessibility of well documented secondary data in litigation files of failed IS projects. Eight cases of IS project failures were selected. SMEs are our domain of interest since those enterprises tend to outsource their IS projects very intensively due to their dependency on external IT knowledge.

To understand OISF we draw on agency theory, which views problems that occur in outsourced environments as the results of three factors: goal differences, risk behaviour differences and information asymmetry. We crafted the agency theory to induce propositions that were testable in our experiments. Together with agency theory we searched for rivalry and competing theories that could help explain phenomenons at a more detailed level. We formulated propositions from organisational trust theory (Zaheer et al., 1998) and prospect theory (Kahneman & Tversky, 1979). Both theories were already used in IS research (Lander et al., 2004; Rose & Rose, 2004).

The remainder of the paper describes the relation of IT and SMEs, followed by the relevant literature on agency theory and outsourcing, and a description of the research method. The final section includes discussion and conclusions, as well as limitations.

2. IT and SMEs

Research and literature have highlighted the definitional problems of SMEs. Companies differ in size, location, business, financial performance, maturity and management style. Europe defines SMEs as independent businesses that employ less than 250 people and with either a turnover of less than 50 million euro or a balance sheet total of less than 43 million euro. SMEs can be split up in micro, small and medium-sized enterprises (European Commission, 2003). Even with this definition SMEs are diverse. Some are dynamic and flexible with a great power to innovate and a vast range of diversity. Some are based on family involvement and embedded in local business environments. Some others are start-ups: fragile organisations striving for survival. Our research focus on genuine SMEs or in the European definition: medium-sized and small enterprises.

In the years of the dotcom hype many believed that IT would enable SMEs to compete with large companies. However a lack of readiness for networking with other enterprises and reluctance to use advanced IT proved otherwise. SMEs perceive little incentive to change business models when returns are unclear (OECD, 2004). Research also showed that SMEs do not excel in knowledge retention and obtaining a sustainable competitive advantage. There is a slower adoption of IT in SMEs than in large enterprises. The methodologies that lead to successful IS implementations in large organisations can therefore not be extrapolated to SMEs, since we are dealing with a completely different economical, cultural and managerial environment. Existing mechanisms of IT governance do not work as such in SMEs where the decision making is mostly centred on one person (Southern & Tilley, 2000). Despite the efforts to develop specific derivative methods of governing IT in SMEs, like the Cobit QuickStart method for practitioners, the implementation is rather disappointing. (IT Governance Institute, 2003).

Due to their small scale and hence a lack of in house IT-skills, SMEs depend more on vendors than large companies (Thong et al., 1994: 210). This does not mean that outsourcing is without risks or problems. From a managerial point of view we associate risk in IT outsourcing with negative outcomes. Two risk scenarios that are of special interest for this research are lock-ins and disputes. A lock-in is a situation where a client cannot get out of a relationship without extra costs (Bahli and Rivard, 2003: 213). Disputes can be separated in litigation and non-litigation. Not all disputes lead to litigation.

3. Principal agent theory and outsourcing

The (positivistic) agency theory (Jensen & Meckling, 1976; Eisenhardt, 1989) has already been used to describe phenomena in IS relations, however there is still a lack of empirical evidence especially in situations that lead to actual failures. Many IS in SMEs are implemented via an outsourced project. Those projects are conducted in an environment in which there is *information asymmetry*. This is typically the situation of a SME (principal) and an Independent Software Vendor or ISV (agent). It is assumed that the agent often has private information about the quality of the IS that is not available to the principal. According to agent theory agents can therefore act in their own best interest.(Tuttle, 1997).

Agency theory addresses relationships in which one party (the principal) delegates work to another (the agent) who performs the work according to a mutually agreed contract. Both parties are self-interested with incongruent goals. This leads to two problems: 1) ex-ante, before signing the contract: the problem of adverse selection and 2) ex-post, after signing the contract: the problem of moral hazard.

Adverse selection arises pre-contractually because the agent possesses private or hidden information about the real quality of his service and the principal is unable to find out that information. This leads to information asymmetry and puts the principal in a disadvantaged position since the principal is faced with a pool of bidders with often insufficient qualifications. The principal cannot easily distinguish the 'bad cars or lemons' from the good ones (Akerlof, 1970: 489).

Moral hazard arises post-contractually when the principal is unable to observe and verify the actions of the agent and may be faced with an agent engaged in hidden actions and not acting in the principal's interest because of goal differences between both parties.

Hidden information and hidden action (sometimes named opportunistic behaviour) are coming into play because the SME-principle cannot monitor the agent's behaviour and performance without agency costs (Jensen & Meckling, 1976:6).

Besides asymmetric information and goal differences, there is an important third factor: risk behaviour differences. The implementation of an IS is highly risky since the outcome is not always stated in measurable outputs and only partly verifiable by organisation members. The likelihood of failure looms large because of this outcome uncertainty. This gives rise to an entrepreneurial risk situated initially with the principal. The transfer of that risk to the agent is not straightforward since both parties' express risk behaviour differences. The principal is assumed risk neutral and the agent risk averse. This assumption is based on the argument '[…] that agents are unable to diversify their employment […] and principals, who are capable of diversifying their investments, should be risk neutral.' (Eisenhardt 1989: 60). However it is assumed that the principal is risk averse when choosing for a "buy" option (Eisenhardt 1989: 65). It is our belief that on the issue of risk behaviour differences the prospect theory is of special interest. When principals are faced with adverse possibilities there is an overweighting of certainty (Kahneman & Tversky, 1979:269)

Agency theory is a well-known and used IS-theory, especially in the research of IS and outsourcing (Dibbern et al., 2004; Aubert, 2005; Bahli and Rivard, 2003). While researchers acknowledge the importance of agency problems, most treat it unidirectional. Opportunistic behaviour is considered to be found with the agent. Very few offer a deeper understanding of how and why agency problems occur. Using case study research we reveal and explain the surfacing and culminating of agency problems in a bidirectional way.

When principal and agent are contracting the negotiated transaction can never be described perfectly. Anderlini and Felli state that: '[...]the contracting parties may lack the necessary degree of rationality necessary to describe exactly the various states of nature in the ex-ante contract they draw up.' (Anderline & Felli, 2004:5). The role of trust in an outsourced IS environment can therefore not be overestimated. Recently a lot of research has been carried out on the relation of trust and IS (Sabherwal, 1999; Lander et al., 2004).

In our research we combine agency theory with prospect theory and with organisational and personal trust theory (Zaheer et al., 1998) to induce testable propositions and to craft patterns in the experimental findings. So far we formulated the following propositions:

- P1 - When asymmetries in information are combined with opportunism, hidden actions may arise from both the agent and the principal.

- P2 – The risk behaviour of agents can evolve from 'risk averse' to 'risk taken' if the possibility of a lock-in scenario becomes possible.
- P3 – Structured controls are not sufficient to eliminate opportunistic behaviour in an outsourced IS project
- P4 – Agents postulate their prospects (proposals) as certainties
- P5 - Trust limits the need for structured controls by reducing the perceived need to guard against opportunistic behaviour

4. Research method

We have chosen for a qualitative and positivistic IS case study research strategy based on multiple cases. The choice for qualitative research is based on the accessibility of well documented secondary data in litigation files of failed IS projects. Eight cases of IS project failures were selected. The positivistic stance of the research is our personal conviction that there is an objective reality of failed outsourced IS projects in SMEs. However those phenomena are embedded in an organisational context which is not separable from the unit of analysis. There are also definitely more variables to be studied than there is data available. This is a situation where the case study is an ideal research strategy (Yin, 2003; Lee, 1989:35). According to Yin a case study research is useful when a phenomenon cannot be studied outside the context in which it occurs or where the boundaries between phenomenon and context are not clearly evident (Yin, 2003:13). Sauer shares the opinion that research to IS failures is best done by case study (Sauer, 1993). The development of the research design and methodology is inspired by the work of researchers experienced in case study research (Eisenhardt, 1989, Lee, 1989; Dubé & Paré, 2003).

A case study protocol was developed to minimize the errors and biases in the study. The protocol contains all procedures, observation protocols and general rules that are followed during the research. The case study protocol offers a guideline for investigators and reviewers who will help in the evaluation of the cases.

We used a longitudinal approach in all cases. Three sources of evidence were used to ensure construct validity: 1) documents, 2) focus and open-ended interviews and 3) direct and participant observations. Project documentation, minutes from steering committee meetings, memorandums and letters were analyzed. Documents were delivered by three sources: plaintiff, defendant and expert witness. The plaintiff and defendant documents were often the same but were brought into litigation for opposed opinions. All expert witness reports were exposed by cross examination of all parties and were corrected if material errors did occur. This resulted in an extra triangulation of the available data. The interviews were recorded on audiotapes and written down in reports and sent to all parties for cross examination. All interviews took place in the present of all parties and the expert witness. The case study sites were visited at least four times for the purpose of doing interviews and direct observations. Additional data was collected during those site visits. In two cases (Stones and Boxcars) evidence was obtained as participant observer. The data coming from all sources was coded by means of a coding scheme, which is part of the case study protocol. The coding scheme separates the basic data from the metadata (the documents, reports, sheets …). The coding scheme was designed to avoid data contamination. All data is stored in a computerised case study database and links are made between basic data and metadata. The data is retrievable by computer but is also available in original and raw format for reviewers. The data analysis is based on alternate template strategy which is a pattern-matching technique (Langley, 1999). Data was analyzed in two steps. First step was a within-case analysis to review the unique patterns of each case. Second a cross-case analysis was conducted in search for common patterns. The cases were selected to allow comparison and to maximise variation as shown in Table 1.

Table 1: Selected cases

	Type of Project	**Result**	**Dispute Resolution**
Case Foam	ERP implementation	Process Failure	Litigation
Case Woody	Software development and implementation	Process Failure	Litigation
Case Mach	ERP implementation	Expectation Failure	Litigation
Case Bupo	Software development	Process Failure	Litigation
Case Dybo	Software development and implementation	Process Failure	Litigation
Case Stones	ERP implementation	Expectation Failure	No litigation
Case Boxcars	DIS implementation	Expectation Failure	No litigation
Case Hero	Software development and implementation	Escalation Failure	Litigation

Similarities pertain to the size of the enterprises; all principal sites are SMEs and the failed result of the project. In terms of variation four projects are ERP implementations, three projects are software development and implementation projects and one project is a software development without implementation.

Case Boxcars is a consortium of 60 car dealers who contracted together for a Dealer Information System (DIS). Customizing took place for all ERP implementations in the observed case. Two cases (Stones and Boxcars) were subject to litigation however an alternative dispute resolution was applied.

Table 2 gives an overview of the observations in our research. For each case we look at:

- *Type of contract*: according to agency theory two types of contracts are possible: outcome-based and behaviour-based. In some cases a mixed form was discovered in which some parts of the contact were outcome-based (in particular software licences) and others (in particular consultancy fees) were behaviour-based.
- *Structural controls:* appropriate mechanisms including deliverables, reporting arrangements, meeting schedules, penalty clauses for governing the project. We searched for two aspects of structural controls: stipulated in contract and performed during the course of the project.
- *External consultancy*: engagement of external expertise.
- *Information asymmetry (private information of agent and of principal):* traces of private information at both parties.
- *Hidden actions (of principal and of agent):* traces of hidden actions.
- *Adverse selection*: adverse selection takes place before signing the contract (ex-ante). The traces could only be observed ex-post, once the project was started.
- *Prospect framing:* the way (positive or negative) the agent is making his proposal to the principal
- *Vendor lock*: a vendor lock is seen as a lock-in situation in which the principal cannot get out of his relationship with the agent.
- *Lack of commitment:* includes lack of oversight and engagement by executives
- *Trust level:* three levels of trust: deterrence-based or calculus-based, knowledge-based and identification-based trust (Lander et al., 2004)
- *Trust deterioration:* decline of trust
- *Trust building mechanisms:* Lander et al. presented a list of trust building mechanisms in outsourced IS development projects (integrity, predictability, communications, commitment, sharing control)

Table 2: Overview and summary of the case observations

	Case Foam	**Case Woody**	**Case Mach**	**Case Bupo**
Principal	Manufacturer (plastic foam)	Trader (lumber)	Trader and manufacturer (veneered boards, ceiling coverings, wall planks)	ISV
Turnover	€50 million	n.a.	€12.75 million	€475000
Staff	100 White collars 450 Blue collars		146 (total)	8 white collars
IT Maturity	CMM level 1	CMM level 1	CMM level 1	CMM level 1
Application	ERP + customizing	ERP development	ERP + customizing	Office application
Cost	Original: €644000 Final: €1.290000	€372000	€90000	€50000
Litigation	Yes	Yes	Yes	Yes
Type of contract	Outcome-based	Outcome-based	Mixed	Outcome-based
Structural controls in contract and in project	Yes/Yes	Yes/Yes	Yes/No	Yes/No
External consultancy	No	No	Yes	No
Private information (agent)	Yes	Yes	Yes	Yes
Private information (principal)	Yes	No	Yes	No
Hidden actions agent	Yes	Yes	Yes	Yes
Hidden actions principal	Yes	No	Yes	No
Adverse selection	No	No	No	Yes
Prospect framing	Positive	Positive	Positive	-
Vendor lock	Yes	No	No	No
Lack of commitment (agent)	No	Yes	Yes	Yes
Lack of commitment (principal)	No	No	No	No
Level of trust	Deterrence	Deterrence	Deterrence	Deterrence
Trust deterioration	Yes	Yes	Yes	Yes
Trust-building mechanism	No	No	No	No

Table 2: Overview and summary of the case observations (cont.)

	Case Dybo	**Case Stones**	**Case Boxcars**	**Case Hero**
Principal	Trader and manufacturer (lumber)	Manufacturer (stones, street furniture)	Dealer in cars	Contractor (waste removal)
Turnover	€15.65 million	€31.25 million	n.a.	n.a.
Staff	16 (total)	80 white collars 120 blue collars	-	5
IT Maturity	CMM level 0	CMM Level 2	CMM level 1	CMM level 0
Application	ERP development	ERP + customizing	DIS + customizing	Office and DB application development
Cost	€50000	€750000	60x€75000	€75000
Litigation	Yes	No (dispute)	No (disputes)	Yes
Type of contract	Mixed	Behaviour-based	Mixed	Outcome-based
Structural controls in contract and in project	No/No	Yes/Yes	Yes/Yes	Yes/No
External consultancy	No	No	Yes	No
Private information (agent)	Yes	Yes	Yes	Yes
Private information (principal)	No	No	No	Yes
Hidden actions agent	No	Yes	Yes	No
Hidden actions principal	No	No	No	No
Adverse selection	No	Yes	Yes	No
Prospect framing	-	Positive	Positive	Positive
Vendor lock	Yes	Yes	Yes	No
Lack of commitment (agent)	No	No	No	No
Lack of commitment (principal)	Yes	No	Yes	Yes
Level of trust	Deterrence	Knowledge	Deterrence	Deterrence
Trust deterioration	Yes	No	No	Yes
Trust-building mechanism	No	No	No	No

5. Discussion and conclusions

The research has not come to an end but some preliminary conclusions can already be drawn.

First of all it is apparent that avoiding OISFs can be very cumbersome. We learned that the establishment of structured controls during the implementation of an IS project is not sufficient to avoid OISFs. In the observed cases we could noticed that a loss of trust was often a very strong determinant for failure, despite structured controls. Trust is often connected to agency problems, although agency theory does not take trust into account. In the literature on IS failures trust is often ignored. In six cases we could observe trust deterioration, although the level of trust was already initially of deterrence-based.

In all cases we observed asymmetric information and found out that principal agent theory has a strong validity but that works in a bidirectional way. All agents had private information concerning the project, which is in line with agency theory assumptions. However we could observe moreover that in at least three cases there were also principals with private information relevant to the project. In two cases (Foam and Mach) one could detect even hidden actions on behalf of the principal. This was already suggested by Moynihan and Aubert.

> *'Agency theory views the exchange primarily from the perspective of the principal. But what of the agent's perspective? What strategies can agents use to protect themselves from potentially opportunistic or other unfavourable forms of behaviour on the part of the principal?' (Moynihan, 2002: 378)*
>
> *'Both clients and vendors tend to behave opportunistically when entering into a contract and this can lead to mutual disadvantage.' (Aubert, 2003: 183)*

The principal in case Mach made a contract for implementing two systems in two separate business units. During the project the principal sold one of the business units without informing the agent.

An outcome-based contract is seen as a solution of controlling opportunistic behaviour of the agent as suggested by agency theory (Eisenhardt, 1989:60). However the outcomes of the contracts in terms of measurable goal indicators were in all cases very poorly specified. Hardware and software licences are mostly mentioned in a detailed way in all contracts, but the real outcome is often defined in very obscure and vague terms. This is a phenomenon not typically for SMEs, but points out to the problem of value perception and measurement in IT investments (Bannister & Remenyi, 2003). We could observe that SME-principals often naively interpret their contract solely as a fixed-price contract, although this is not always formally true. On the other hand the uncertainty of the outcome of an IS implementation gives rise to a difference in risk behaviour which is well described by agency theory.

The overall IT maturity of the principal was assessed during the research and was scored to the CMM maturity levels also used in Cobit. Since not al IT processes occur in SMEs (IT Governance, 2003) it is fairly easy to assess the IT maturity. The overall maturity was in all cases very low, which is very typical for SMEs.

An explanation for the problem of adverse selection is given by Akerlof (Akerlof, 1970). ISVs that are active on a SME marketplace tend to comply with the Akerlofs Lemon-theory. However there are other mechanisms involved that can be explained by prospect theory. Further research however is needed here.

In appendix A we provide more information on the observations of the project characteristics private information and hidden actions.

This paper represents a first step in an on-going research. The approach adopted here is comparable with forensic investigation where a chain-of-evidence in a post-mortem is carefully built up. The process of revealing the information patterns in the experimental data is tedious and far from straight forward. Much remains to be done to improve the matching of the theoretical and empirical patterns.

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Appendix A

Observations of the project characteristics private information and hidden actions	
Case Foam	
Private information of agent:	Agent knew that a higher budget was needed for customisation Agent sold a computer with a lower internal memory capacity than correctly calculated by the dimensioning program
Private information of principal:	Principal did not inform the agent that an internal BPR program in the manufacturing division failed
Hidden actions agent:	Agent starts working on customizations without informing the principal Agent did not give detailed information on work performed Agent assigned an inexperienced project leader to the project Agent assigned inexperienced programmers to the project
Hidden actions principal:	Principal assigned an inexperienced project leader to the project
Case Woody	
Private information of agent:	Agent knew that the budget needed was much higher than the proposed one
Private information of principal:	Not observed
Hidden actions agent:	Agent assigned an inexperienced project leader to the project Agent assigned inexperienced programmers to the project
Hidden actions principal:	Not observed
Case Mach	
Private information of agent:	Agent sold obsolete software
Private information of principal:	Principal had a plan to sell a business unit
Hidden actions agent:	Agent assigned inexperienced project leader to the project
Hidden actions principal:	Principal sold a business unit during the course of the project
Case Bupo	
Private information of agent:	Agent's project leader dismissed just after finishing the design of the software
Private information of principal:	Not observed
Hidden actions agent:	Agent assigned inexperienced programmers to the project
Hidden actions principal:	Not observed
Case Dybo	
Private information of agent:	Agent sold software which was not yet fully finished and debugged Agent built in old parts of software into the new software
Private information of principal:	Not observed
Hidden actions agent:	Not observed
Hidden actions principal:	Not observed
Case Stones	
Private information of agent:	Agent did not tell the principal that the owner of the ERP package sold his software to another vendor Software contained licensed programs from third parties Agent did not tell the principal that new vendor was involved in a Chapter 11 procedure
Private information of principal:	Not observed
Hidden actions agent:	Agent modified software without informing the principal Agent assigned inexperienced programmers to the project
Hidden actions principal:	Not observed
Case Boxcars	
Private information of agent:	Agent sold software with modifications which were not yet fully finished and debugged Agent sold software based on old technology Agent worked on new software based on new technology
Private information of principal:	Not observed
Hidden actions agent:	Agent modified software without informing the principal (customer) Agent installed software without informing the principal (steering committee)
Hidden actions principal:	Not observed
Case Hero	
Private information of agent:	Agent sold a software package as an empty box
Private information of principal:	Principal did not inform the agent of the staff changes Principal did not assign a skilled project leader
Hidden actions agent:	Not observed
Hidden actions principal:	Not observed

